The filters have historically had capacity challenges at times during summer when demand is high without water restrictions. The issues needed to be addressed to restore the treatment capacity before October 2023 prior to start of summer demand period.
To ensure timely resolution of the issues, a troubleshooting working group consisting of an external process expert, the programme manager, business owner, and senior users was formed. A root cause analysis, actions and outcome log were created. Table 2 summarised all the issues, potential root causes and diagnostic testing actions.

10th IWA-ASPIRE CONFERENCE AND WATER NEW ZEALAND CONFERENCE & EXPO
Christchurch Ōtautahi
29 September - 3 October 2025

EMBRACING VIGILANCE

Lutra.

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Hamilton City Council
Te kaunihera o Kirikiriroa

INTRODUCTION

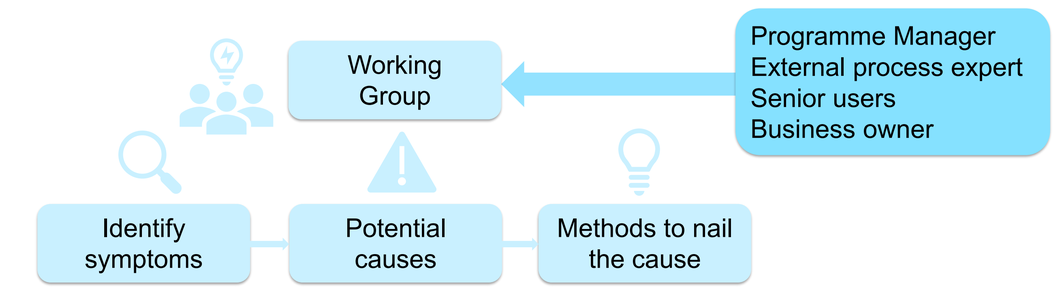
Hamilton City Council (HCC) owns and operates the Waiora WTP, treating water from the Waikato River. Principle 1 of drinking water safety is that a high standard of care should be embraced. What happens when a treatment barrier, though still effective, is not performing correctly? This poster outlines responses following an adverse impact directly linked to one filter refurbishment and how HCC resolved these issues in a timely manner before the risk was realised and impacted capacity and supply issues.

Filter #1 is one of 10 rapid gravity filters using a dual media design of expanded pumice and fine sand. Filter #1 media and ceramic nozzles were replaced in October 2022. In January 2022, higher backwash pressure and shorter run times were observed and water production volumes reduced.

HIGHLIGHTS

- Filter #1 at Waiora WTP performed poorly after media and nozzle renewal.
- A working group was formed to assess the issues.
- Issues were identified and rectified and changes implemented to prevent the issues occurring in the future.

METHODS

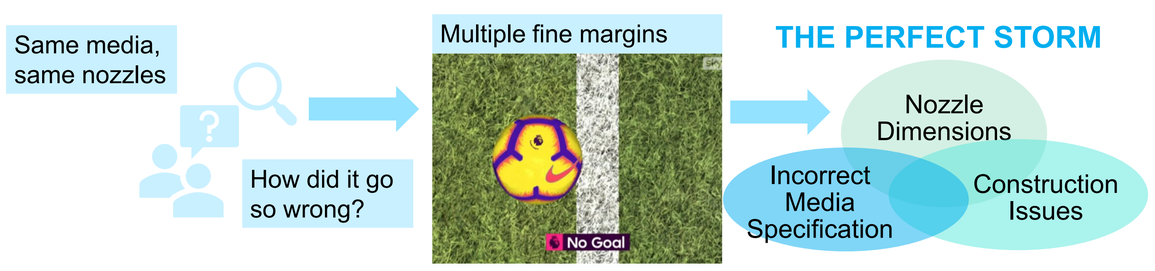


- High Backwash Pressure
- Short Filter Run Time
- Low backwash flow
- High clean bed head loss
- Uneven flow distribution

- Valve Failure
- Plenum blockage
- Nozzles & Stems
- Air lock
- Finer media
- Laterals blockage

- Valve performance investigation
- CCTV Plenum
- Visual observations of media fluidisation
- Pilot filter comparisons
- Check nozzles / compare performance
- Breather/manometer pipe on plenum
- Measure head loss in situ from the base of the media
- In situ media grading comparisons
- Relocate media to performing filter and check change in head loss

DISCUSSION



Ceramic nozzles are a specialty product supplied by only one supplier.

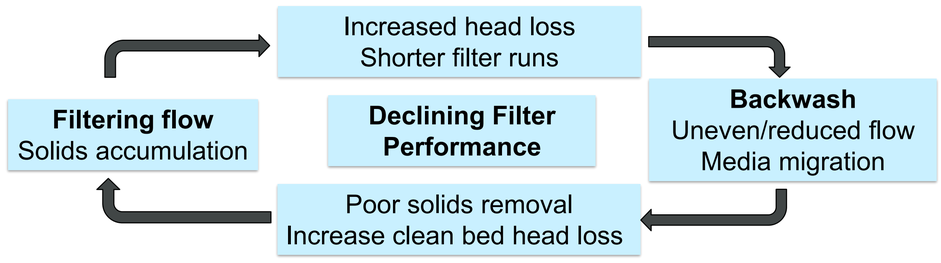
The supplier was sold and unknown to anyone, the stocked nozzles were slightly thinner than the existing nozzles.

Inconsistent lateral heights meant variable penetration into the laterals.

7mm greater penetration allowed nozzles to block on high set laterals.

Uneven flow distribution, high head losses, and for some bent nozzle stems.

The media This was the first filter with a complete media replacement to PCDM (0.3 - 0.6mm) sand and 0.6 -1.2 mm silicon sponge (expanded pumice). It was discovered through media sampling and pilot filter runs that the smallest sand grains migrated to the top layer, filling voids and creating a fine top layer that restricted flow. Prior to this, filters had a larger sponge grade (no longer available) so void spaces were much larger and head losses therefore lower.

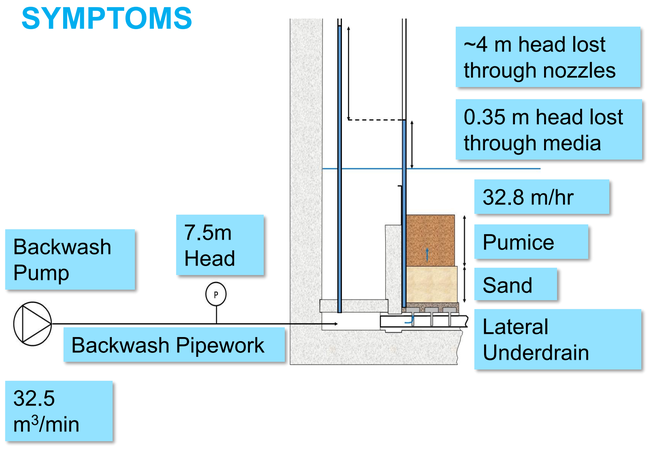


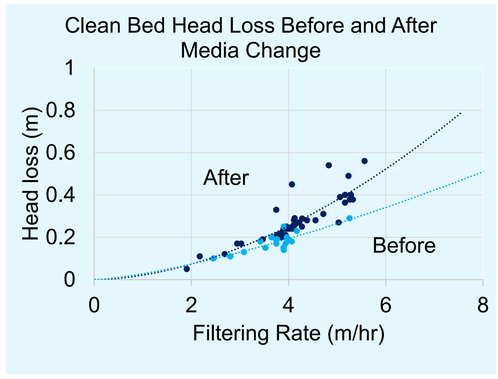
REMEDIAL ACTIONS

- The existing nozzles were cleaned and reinstated
- Nozzles stems were each checked and trimmed to ensure clearance to the invert of the lateral
- Filter media was replaced with new dual combination to prevent sand migration
- Methodologies established for future works based on the lessons learnt
- QA process established for individual work packages

RESULTS

SYMPTOMS

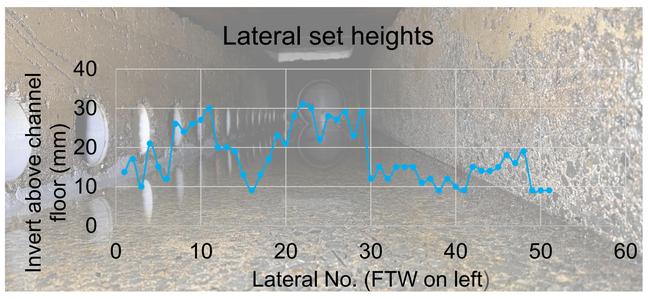




FINDINGS

Construction Faults

- Laterals set at different heights in the filter floor
- Nozzle depth into pipe varies based on lateral height



Supplier Fault

- Installed ceramic nozzles were 7 mm thinner than previous

Media Specification

- Fine sand (0.3 to 0.6 mm) from the lower media layer migrated into the top layer.

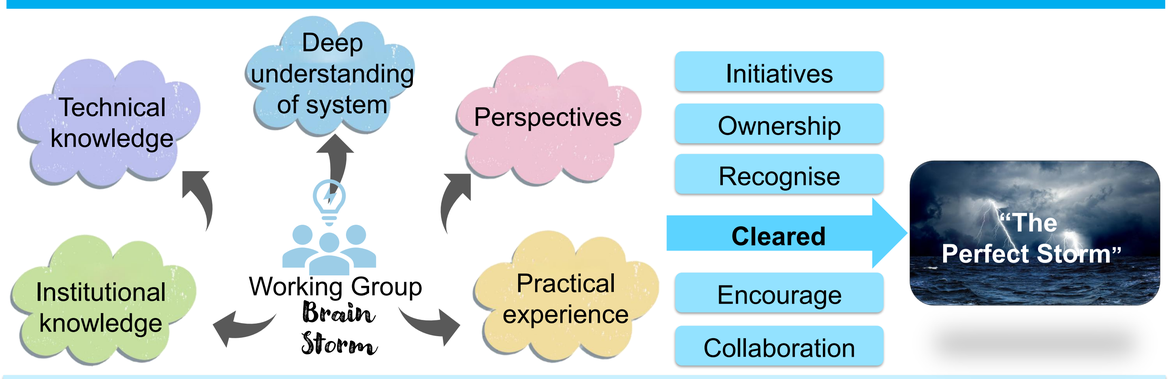
Silicon Sponge Particle Size Distribution

Size (mm)	Percent Passing
2.360	100
1.180	88
0.600	37
0.425	29
0.300	16
0.150	1
0.075	0

OUTCOMES

- Immediate improvement to backwash and filter performance.
  - Backwash pressure reduction from > 75 kPa to 50 kPa
  - Backwash flow from 32.5 m^3/min to 36 m^3/min
  - Filter run times from 48 hours to 96 hours
  - Reduced filter head losses from > 2m to < 1.5m
- Following 2 filters refurbishment to date have no issues.“*best one ever*” – *Operations Manager*

CONCLUSIONS



- This case highlights the importance of **Principle 1 of safeguarding drinking water** - taking a high level of care.
- The formation of a working group not only restored the Sand Filter 1’s performance but also created a framework for better planning of future refurbishment.

Acknowledgement: Maire Porter (HCC); Brent Arden (HCC); Karl Hjelmstrom (HCC); Rebecca Johnson (HCC); Evan Vaughters (ex HCC); Dany Rush (HCC); Rhys Stevenson (HCC); Steve McIntosh (Absorb It); Jonathan Church (Lutra); Iain Rabbits (ex Lutra)